

REMARKS/ARGUMENTS

Claims 1-28 are present in this application.

Claims 1 and 2 were rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,577,675 to Ishihara et al. in view of International Patent Publication WO 99/28690 to Valle et al. and U.S. Patent No. 6,120,661 to Hirano. This rejection is respectfully traversed.

Initially, Applicant respectfully submits that those of ordinary skill in the art would not have been motivated to refer to the teachings of Hirano or to combine the teachings of Hirano with Ishihara in combination with the teachings of Valle to arrive at the present invention. Hirano is directed to an apparatus for processing a glass substrate or a thin film formed on a glass substrate by etching, CVD or sputtering. The disclosure at column 13, lines 42-48 referenced by the Examiner relates to the glass substrate supporting stage 10. Since the apparatus disclosed by Hirano, however, is not for conveying a sheet glass or stainless steel plate of a particular state as in the present invention (see, for example, page 1 of the present specification), the required physical properties therefor and technical field thereof are significantly different from those in the present invention. Even under the Supreme Court's recent decision in *KSR International Co. v. Teleflex Inc.*, those of ordinary skill in the art could not have predicted the results of the purported combination in the Office Action as the elements do not merely perform the same functions as performed separately. As such, those of ordinary skill in the art would not look to a supporting stage to address a technical problem relating to a disc roll.

In this context, the ceramic member in the Hirano patent is composed of a porous cordierite ceramic where a general powder-sintered ceramic member is obtained by sintering at a high temperature of 1200°C while a fiber board is obtained by sintering at a low temperature approximately 800°C and is formed into a porous member by sintering so as to have cordierite

ceramic powder bonding intimately to surfaces of cordierite ceramic fibers with binders. Hirano describes that the porosity and the pore diameter of the ceramic member composed of porous cordierite ceramic to be obtained can be adjusted by changing the volume ratio of the cordierite ceramic powder and the cordierite ceramic fiber. For producing the glass substrate support stage 10, the ceramic member is heated, and an aluminum-containing material in a molten state is pressure cast such that the aluminum-containing material fills in the porous fiber boards. See column 13, line 66 – column 14, line 9. The porosity of the ceramic member is thus significant in formation of the final product. The supporting stage thus constructed is tested for suitability by subjecting the supporting stage 10 to temperatures of 300°C. See, for example, column 14, lines 49-67.

In contrast, the disc roll of the type described in the present application are subjected to far higher temperatures (exceeding 1300°C in the present application), and substantial distinctions exist between the physical properties of the disc roll defined in Ishihara and those of the Hirano supporting stage. Applicant thus respectfully submits that those of ordinary skill in the art would not look to the Hirano structure to modify the Ishihara structure as further modified by Valle.

Still further, the present invention achieves unexpected results of improving spalling resistance owing to the specific composition as claimed. The “Wear Resistance Test” described on page 34 of the specification corresponds to evaluation of spalling resistance. Table 1A on page 36 shows that the disc rolls of the present invention are remarkably excellent in heat resistance (“Rate of Thermal Change”) and in spalling resistance (“Wear Resistance”) as compared to Comparative Example 1.

The incorporation of cordierite, which has a low thermal expansion coefficient, makes it possible to reduce the thermal expansion coefficient of the entire roll. As a result, the difference in thermal expansion due to the temperature difference between the outer side and the inner side of the roll caused at the time of temperature-rising (heated from the outside in a furnace) and temperature-lowering (generally, cooled from the outside) becomes small. Therefore, the stress generated in the material is reduced, leading to the improvement of spalling resistance.

Still further, the disc roll type of the present invention is typically cooled by cooling the shaft with water. Therefore, although the surface of the roll is exposed to temperatures near or exceeding 1200°C, the periphery of the shaft is cooled by water cooling, resulting in a large temperature difference between the roll surface and the inside portion thereof. By making the thermal expansion coefficient small, the difference in thermal expansion between the roll surface and the inside portion can be made small, thereby suppressing stress generated in the material.

With reference to Table 1A on page 36 of the specification, it is apparent that the composition of the claimed invention exhibits unexpected results. That is, by the claimed combination, the material for the disc roll achieves exceptional heat and wear resistance. Such results could not be obtained using the components individually. As such, Applicant submits that those of ordinary skill in the art would not have recognized in view of the references of record that the results obtained by the present invention were predictable. Applicant submits that for this reason also, the rejection is misplaced.

With regard to dependent claim 2, Applicant submits that this claim is allowable at least by virtue of its dependency on an allowable independent claim. Reconsideration and withdrawal of the rejection are respectfully requested.

NAKAYAMA
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In view of the foregoing remarks, Applicant respectfully submits that the claims are patentable over the art of record and that the application is in condition for allowance. Should the Examiner believe that anything further is desirable in order to place the application in condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Prompt passage to issuance is earnestly solicited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /Alan M. Kagen/
 Alan M. Kagen
 Reg. No. 36,178

AMK:jl
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100